

## **SECTION 31 00 00 Earth Work**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section Includes: Clear site, excavate for new construction, and remove excess subsoil and materials from site.
  - 1. Shore and brace excavations as required.
  - 2. Cap and seal discontinued utility services and remove portions of lines within excavated areas. Note on As-Builts and include Photographs of all discontinued utility services in As-Builts.
  - 3. Dewater excavation(s) as necessary.
  - 4. Excavate subsurface material.
  - 5. Place and compact fills to rough grade elevations.
- B. Related Sections:
  - 1. Division 01 - General Requirements
  - 2. Section 016010 LEED v4 Product Requirements
  - 3. Section 024100 Demolition
  - 4. Division 21 - Fire Suppression
  - 5. Division 22 – Plumbing
  - 6. Division 23 - Heating Ventilation and Air Conditioning HVAC
  - 7. Division 26 – Electrical
  - 8. Division 27 – Communications
  - 9. Division 28 - Electronic Safety and Security
  - 10. Section 311000 Site Clearing
  - 11. Section 312000 Trenching, Backfilling, and Compaction
  - 12. Division 32 - Exterior Improvements
  - 13. Division 33 - Utilities

#### **1.2 REFERENCE**

- A. Geotechnical Engineering Report, if provided by/for the project, and all addendums thereto.
- B. Current version of Cal Poly Merged Campus Standards.

#### **1.3 GENERAL**

- A. Refer to LEED v4 Reference Guide, for detailed submittal and performance requirements for the LEED application, if applicable to project.
- B. Minimize site disturbance, where possible, during construction
- C. All requirements of the Cal Poly Standards apply, notify designer/engineer and Cal Poly Representative if conflict exists.

#### **1.4 SUBMITTALS**

- A. Procedures: In accordance with pertinent provisions of Division 01.
- B. Shop Drawings: Provide for shoring and cribbing.
  - 1. Certification: Provide certification by California registered civil or structural engineer indicating methods for shoring and cribbing comply with applicable codes and standards.
    - a. Calculations: Where specifically requested in writing by University, submit design calculations of shoring and cribbing for University record only.

#### **1.5 PROJECT CONDITIONS**

- A. Protect bench marks, existing structures, roads, sidewalks, paving, and curbs against damage from equipment and vehicular or foot traffic.
- B. All work shall comply with the recommendations of the project geotechnical report, as applicable (e.g. if provided by/for the project).
- C. The Contractor shall be responsible to estimate earthwork quantities including considerations for shrinkage, finished grade/surface hold downs and subgrade material, import of select material and engineered fill, trenching spoils and backfill, phasing, means and methods, trucking, and usability of existing site material including hard formational and saturated material.
- D. Protect excavations by shoring, bracing, sheet piling, or underpinning to protect adjacent roads, structures, and utilities and to support adjacent construction operations and improvements, and to prevent caving, sloughing, or cracking of adjacent material and disturbance of adjacent subsurface material. If excavations disturb adjacent soils resulting in cracking or other indications of movement or reduction in compaction, the Geotechnical Engineer of Record or the Campus Geotechnical Engineer may require removal and replacement of adjacent soils with engineered fill and at no additional cost to the University.
- E. Underpin adjacent structures which may be damaged by excavation work, including service lines and pipe chases.
- F. Notify University of unexpected subsurface conditions and discontinue work in area until University provides notification to resume work.
- G. Maintain drainage of site during construction to prevent ponding adjacent to structures, excavations and toes of slopes. The Contractor shall not permit water to pond in excavations. Areas of ponded water may be required to be removed and replaced with recompacted material if subgrade has been compromised.
- H. Implement, maintain, and comply with the project Stormwater Pollution Prevention Plan (SWPPP). Add and adjust SWPPP Best Management Practices (BMPs) as necessary to comply with the SWPPP and the State Construction General Permit.
- I. Implement measures for prevention of blowing dirt and dust.
- J. Provide and maintain usable roadways on the site throughout construction.
- K. Coordinate with University on allowable trucking times and routes through campus prior to commencement of work. Alternative routing and allowable trucking times may be

required during scheduled campus events (e.g. Student Move-in), and shall be done at no additional costs to the University.

- L. The contractor shall maintain site grades to provide positive drainage around structures and prevent ponding and/or infiltration of water adjacent to structures, foundations, excavations, and retaining walls.
- M. If the finished elevation or slope is disturbed during the course of construction, the contractor shall repair and restore the finished graded condition. If subgrade is disturbed or modified, it shall be repaired and restored prior to finished grading, landscaping, and placement of finished surface materials.
- N. Unpaved ground surfaces shall be graded during construction, and per Section 1804.4 of the CBC, shall be finish graded to direct surface runoff away from foundations, slopes, and other improvements at a minimum of 5 percent grade for a minimum distance of 10 feet. If this is not practicable due to terrain, surface improvements, or proximity of property/site boundaries, swales with improved surfaces, area drains, or other drainage features shall be provided to divert drainage away from these areas.

## **PART 2 – PRODUCTS**

### **2.1 MATERIALS**

- A. Geotechnical Investigation: Comply with recommendations in project geotechnical report(s) and all addenda thereto., as applicable (e.g. if provided by/for the project).

## **PART 3 – EXECUTION**

### **3.1 EXAMINATION**

- A. Establish extent of excavation by area and elevation; designate and identify datum elevation.
  - 1. Consult campus utilities atlas and University Facilities Planning and physically pothole to determine exact elevation and location of utilities.
- B. Set required lines and levels.
- C. Maintain bench marks, property markers, and other reference points.

### **3.2 PREPARATION**

- A. Establish location and extent of underground utilities occurring in work area before starting excavation.
- B. Maintain, reroute, or extend as required for construction and construction operations, existing utility lines to remain which pass through work area.
- C. Protect utility services uncovered by excavation.
- D. Remove abandoned utility service lines from areas of excavation; cap, plug or seal abandoned lines and identify at grade.

- E. Accurately locate and record abandoned, and active utility lines rerouted or extended with x, y, and z coordinates, on Project As-built Documents and include Photographs of all abandoned, and active utility lines rerouted or extended utility lines in As-Builts.
- F. Clear site of landscaping and hardscaping not previously removed, as required for new construction. See Division 02 - Existing Conditions

### 3.3 EXCAVATION

- A. Geotechnical Investigation: Comply with the Geotechnical Report Recommendations for all excavations, as applicable (e.g. if provided by/for the project).
- B. Excavate sub-soil in accordance with lines and levels required for Work, including space for forms, bracing and shoring, foundation drainage system, applying waterproofing, hold downs, keying and benching, and to permit testing and inspection.
  - 1. Assume responsibility for design, installation, and maintenance of required shoring and sheet piling.
- C. Notify the University if an excavation will extend into the drip line of any tree. Do not impact or remove trees not marked on the plans as such without prior authorization. Contractor shall coordinate with the University for conditions and limitations to work adjacent to these trees. See Section 015639 Temporary Tree and Plant Protection, for requirements.
- D. Subsurface water is commonly found across campus at the soil and bedrock contact. Protect in- place any subsurface drains not marked for demolition. If subsurface water is encountered, notify the University. Do not proceed with excavation without an adequate dewatering or water management plan. If dewatering is required, the Contractor is responsible to install, operate, and maintain the system(s) to provide suitable conditions for construction operations, placement of fill material, and construction of foundations.
- E. Hand trim excavations and leave free from loose or organic material. Cut any roots that protrude into the excavation flush and clean with limits of excavation.
- F. When complete, verify depths and dimensions of excavation and that subgrade is firm and unyielding, suitable for placement of fill and construction of improvements per plan.
- G. Correct unauthorized excavation as directed.
- H. Excavations shall not extend below a 1:1 plane extending from 9 inches above the bottom of any adjacent footing, pier, foundation, or existing improvement unless adjacent structures, roadways, and surfaces have been adequately supported, shored, or underpinned.
- I. Remove excess or unsuitable excavated material from site. Comply with University requirements for trucking including permissible trucking routes, hours, and traffic control. Unsuitable material includes but is not limited to, oversized rock, contaminated soil, debris, and roots.
- J. Voids created by dislodging cobbles and/or debris during scarification shall be backfilled and recompact and the dislodged materials shall be removed from the area of work.
- K. Coordinate with other trades for special requirements and arrangements regarding excavation to rough out elevations. The construction manager shall fully coordinate work between trades, contract drawings, specifications, field conditions, Cal Poly Construction

Standard Specifications, code, and according to provisions stated in Contract General Conditions and per Specification Section 013113. This shall be the sole responsibility of the Construction Manager/General Contractor. Do not delegate responsibility for coordination to any subcontractor.

### **3.4 BACKFILLING**

- A. Geotechnical Investigation: Comply with the Geotechnical Report Recommendations for all excavations, as applicable (e.g. if provided by/for the project).
- B. Geotechnical engineer shall review subgrade prior to placement of fill. Subgrade shall be firm and unyielding and free of debris, as applicable (e.g. if provided by/for the project).
- C. Soils shall not be compacted by wetting or jetting.
- D. Backfill shall be performed with equipment, material types, and methodology to provide uniform and stable conditions for placement of proposed improvements.
- E. Where temporary unbalanced pressures are likely to develop during backfilling, erect necessary shoring to counteract imbalance. Where possible, backfill using methods to equalize soil pressures.
- F. Excavations shall be backfilled as such to prevent water from ponding against or adjacent to foundations, structures, retaining walls, and open excavations.

### **3.5 FILL TYPES AND COMPACTION**

- A. Geotechnical Investigation: Comply with Geotechnical Engineer recommendations for fill types and compaction, as applicable (e.g. if provided by/for the project).
- B. See Section 2.1 Materials.
- C. See Section 3.4 Backfilling.
- D. Compaction: Use approved mechanical methods.
- E. Tolerances: When tested with a 16'-0" straight-edge, fill shall not show deviation in excess of 1/2" or be more than 0.05 foot from true grade as established by grade hubs or pins.
  - 1. Deviation in excess of these amounts shall be corrected by loosening, adding or removing materials, reshaping and recompacting.

- F. Remove surplus backfill and excess materials from site.

### **3.6 FIELD QUALITY CONTROL**

- A. Special inspection of grading shall be provided per Section 1705A.6 Soils and TABLE 1705A.6 of the current Office of the State Fire Marshal adopted CBC. The special inspector shall be under the direction of the geotechnical engineer, as applicable (e.g. if provided by/for the project) and/or the Cal Poly Representative.
- B. Laboratory Soils Density Tests: Schedule services of independent testing laboratory acceptable to University to perform soil density tests; notify testing laboratory not less than two working days in advance of grading and filling operations.
  - 1. Soils Density Tests: Conform to ASTM D1557, unless otherwise directed by the University and approved by geotechnical engineer, as applicable (e.g. if provided by/for the project), and/or the Cal Poly Representative.
  - 2. Do not proceed with additional portions of work until results have been verified in writing.
  - 3. If tests indicate compacted materials do not meet specified requirements, remove defective work, replace and pay for retesting.
- C. Field Density Tests: Independent testing laboratory shall also provide sand cone density test, ASTM D1556, and nuclear density test, ASTM D2922, field density tests verifying compliance with specified requirements.
  - 1. Slabs and Paving Areas: Provide minimum one field density test for every 2,000 square feet of area within earthwork, but in no case less than three tests.
    - a. Provide test for subgrade and for each compacted fill layer.
  - 2. Foundation Backfill: Perform minimum two field density tests.
  - 3. Additional Tests: Perform where laboratory reports and where field density tests indicate density is below specified requirements.

**END OF  
SECTION**

### **31 10 00 - Site Clearing**

All unsuitable materials, as defined in a Soils Engineering Report, shall be removed from the site and disposed of in a suitable location.

Erosion control measures and BMPs shall be implemented in accordance to the SWPPP and dust control shall be employed at all times.

### **END OF SECTION 31 10 00**

### **31 22 00 - Grading**

Ponding and areas of low flow gradients should be avoided unless part of a designed storm water mitigation measure such as bio-retention swales, or rain gardens. Positive surface drainage or drainage devices such as swales or drain inlets shall be provided wherever required to convey water away from building foundations.

Storm drainage shall be directed away from all buildings. If in the rare case this cannot be accomplished, redundant drainage systems are required. There shall be no potential for ponding water that could flood into a building. Safe overland flow paths must be provided in case storm drains clog or their capacity is exceeded.

Site retaining or planter walls shall have waterproofing and adequate drainage to prevent additional loading. Provide a water proofing system at the backside, and foundation drains at the base. Drains may be tied into the storm drain or an appropriate location. Retaining walls more than 30" in height from top to finished grade are required to have a 42" high guardrail or other approved protective measure.

Provide flat areas for all utility slabs, vaults or boxes.

Finished grade elevations shown on the grading plan shall be to the finished surface elevation at 0.1' increments for soils surfaces and at 0.01' increments for hard finish surfaces. Contractor shall subtract structural thickness of pavements of top soil to achieve rough grading elevations. Proposed grading contours shall be indicated at 1-foot contour intervals.

### **END OF SECTION 31 22 00**

## **SECTION 31 22 19**

### **LANDSCAPE GRADING**

#### **PART 1 - GENERAL**

##### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.
  - 1. Refer to the following site for California Polytechnic State University San Luis Obispo <https://afd.calpoly.edu/facilities/planning-capital-projects/construction-standard/standard-specifications#div01>
- B. Division of State Architect (DSA) may review design conformance with CBSC Chapter 11, for accessibility requirements.
- C. Division 32, Specifications Sections "Soil Preparation", and "Landscape Drainage".

##### **1.2 SUMMARY**

- A. This Section includes landscape finish grading complete, as shown, and as specified.
- B. Unit Pricing: Per square foot.

##### **1.3 PROJECT/SITE CONDITIONS**

- A. Existing Conditions: For protection of existing trees to remain, see Division 01, Section "Temporary Tree and Plant Protection"
- B. Dust Nuisance: Assume full responsibility for alleviation or prevention of dust as a result of grading work.

##### **1.4 SEQUENCING AND SCHEDULING:**

- A. Complete all finish grading prior to installation of sprinkler irrigation systems in each area graded.
- B. Regrade as required to finish grades established by Landscape Architect once the irrigation system is installed.

#### **PART 2 - PRODUCTS Not Applicable**



## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verification of Conditions: Verify that the following items have been completed prior to commencement of finish grading:
1. Installation of [stockpiled] topsoil and soil preparation including debris removal.
  2. Incorporation of soil amendments.

### **3.2 INSTALLATION**

- A. General:
1. Ponding and areas of low flow gradients should be avoided unless part of a designed storm water mitigation measure such as bio-retention swales, or rain gardens. Positive surface drainage or drainage devices such as swales or drain inlets shall be provided wherever required to convey water away from building foundations.
  2. Storm drainage shall be directed away from all buildings. If in the rare case this cannot be accomplished, redundant drainage systems are required. There shall be no potential for ponding water that could flood into a building. Safe overland flow paths must be provided in case storm drains clog or their capacity is exceeded.
  3. Max Slope of maintained landscape area shall not exceed 4:1. If this is not possible due to site conditions please notify the University Representative.
- B. Finish Grading:
1. Provide all grades for natural runoff of water without low spots or pockets. Accurately set flow line grades at 2 percent minimum gradient unless otherwise noted in Drawings.
  2. Finish grades shall be smooth, even and on a uniform plane with no abrupt changes of surface. Slope uniformly between given spot elevations.
  3. Grades not otherwise indicated shall be uniform levels or slopes between points where elevations are given, or between points established by walks, paving, curbs or catch basins.
  4. Tops and toes of all slopes shall be rounded to produce a gradual and natural-appearing transition between relatively level areas and slopes.
- C. Tolerances:
1. All planting areas, including lawn areas, shall be true to grade within 1 in. when tested with a 10 ft. straightedge.
  2. Hold finished grades below top of adjacent pavement, headers, curbs, or walls as follows:
    - a. Shrub, Annual and Groundcover Areas: 1-1/2 inches.
    - b. Seeded Lawn Areas: 3/4 inch.

- c. Sodded Lawn Areas: 1 inch.
  3. Hold finished grades below Drain Inlets as follows:
    - a. Gabions: 2-3 inches.
    - b. Groundcover: 1-1/2 inches.

**END OF SECTION 31 22 19**

**31 23 33 - Trenching and Backfilling**

Standard: Coordinate backfilling with installation of underground duct markers for utilities. Backfill with sand to 12 inches above utility duct. Install duct markers 6 inches below finished surface. See specific campus standard specification for required backfill requirements.

Schedule: Storm and Sanitary Piping: Cover pipe and bedding with      inches. See specific campus standard sections for required backfill requirements by Division.

<b>Utilities</b>	<b>Fill Type</b>	<b>Bedding and Cover Thickness, minimum</b>	<b>Compaction, minimum</b>	<b>Underground Duct Markers</b>
Water Utilities Including Irrigation	Sand	1" below 3" above		
Sanitary Sewerage Utilities				
Storm Drainage Utilities				
Natural-Gas Distribution Utilities				
Hydronic Utilities			95%	
Electrical Utilities				
Communication			95%	

**END OF SECTION 31 23 33**